STAT100 Problem Set 9
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Section 0122

1a.
$H_0 : \mu_{m1} - \mu_{m2} = 0$
$H_a : \mu_{m1} - \mu_{m2} \neq 0$

1b.
This is a two sided test, since the alternative hypothesis is not looking for greater or less than, rather it is looking on either side and has the not equals sign.

1c.
$t = \bar{y}_1 - \bar{y}_2 / \text{sqrt}((s_1^2 / n_1) + (s_2^2 / n_2))$
$t = 1.15 / \text{sqrt}(0.11726228571 + 0.14171657142)$
$t = 1.15 / \text{sqrt}(0.25897885713)$
$t = 1.15 / 0.5088996533$
$t = 2.25977752695$
$t = 2.260$

1d.
$p = Z < -2.260 + Z > 2.260$
$p = 0.0047 + 0.0047$
$p = 0.0094$

1e.
Since the p value of 0.0094 is smaller than the level of significance of 0.05, we reject the null hypothesis. There is sufficient evidence that there is a significant difference between the mean number of correct identifications between students using Module 1 and students using Module 2.

2a.
$H_0 : \mu_1 = \mu_2$
$H_a : \mu_1 > \mu_2$

2b.
This is a one-sided test because the alternative hypothesis is looking for greater than.

2c.
$t = \bar{y}_1 - \bar{y}_2 / \text{sqrt}((s_1^2 / n_1) + (s_2^2 / n_2))$
$t = 1.53 / \text{sqrt}(0.60720064935 + 0.60065641025)$
$t = 1.53 / \text{sqrt}(1.2078570596)$
$t = 1.53 / 1.09902550453$
$t = 1.39214239678$
$t = 1.392$

2d.
$p = P(Z >= 1.39)$
$p = 1 - 0.9177$
$p = 0.0823$

2e.
At a significance level of 0.05, since the p value is larger than 0.05, we fail to reject the null hypothesis. There is not sufficient evidence that there is a significant difference in the mean gain in SAT verbal scores between students that were coached after their first attempt and students that were not coached after their first attempt.

2f.
At a significance level of 0.10, since the p value is smaller than 0.10, we reject the null hypothesis. There is sufficient evidence that students that were coached after their first attempt experienced larger mean gains in their SAT verbal score than students that were not coached after their first attempt.

2g.
No, there was a different conclusion based on the level of significance. A test statistic of $t = 1.65$ would provide the same conclusion, however, under either 0.05 or 0.10 levels of significance.